

In the Claims

For the convenience of the Examiner, all pending claims of the present Application are shown below whether or not an amendment has been made.

1. (Currently Amended) A method of operating a data processing system, the system comprising one or more application programs requiring persistent data storage for data files of application data, a plurality of physical storage devices each accessible via a computer network to one or more computers executing the application programs, and a broker program, wherein the method comprises:

receiving, by the broker program, a request from an application program for storage of a data file of application data of the application program, the request including an expiry date set by the application program, beyond which the data file is no longer required and may be deleted;

selecting, by the broker program, a first physical storage device ~~one of the plurality of~~ physical storage devices to store the data file according to the expiry date of the data file and a state of the first physical storage device by: device; ~~and~~

determining that the expiry date of the data file occurs before a device expiry date associated with the first physical storage device; and

determining that the expiry date of the data file occurs within a predetermined range of the device expiry date; and

preventing, by the broker program, the data file from being deleted until the expiry date of the data file has been reached.

2. (Previously Presented) A method according to claim 1, comprising monitoring, using the broker program, the remaining storage space available on each of the storage devices, to distinguish between in-use storage devices which have had data files written to them and empty storage devices which have not.

3. (Previously Presented) A method according to claim 2, wherein the selecting step comprises selecting in-use storage devices in preference to empty storage devices.

4. (Original) A method according to claim 2, comprising: monitoring how much data is waiting to be written to each storage device, to detect an overload condition in the process of writing the data; and selecting, if an overload condition is detected for a storage device selected for storage, a different storage device for storage.

5. (Previously Presented) A method according to claim 4, wherein the selecting step comprises selecting in-use storage devices in preference to empty storage devices.

6. (Currently Amended) A method according to claim 1, comprising: storing, for each storage device, the latest expiry date of data files stored on that device, or of data files that are to be stored; and permitting application data to be stored on a storage device if its an expiry date associated with the application data is within a predetermined range occurring after of the latest expiry date. ~~date; such that application data with similar expiry dates can be stored together and when such similar expiry dates have passed the storage device can be erased and re-used.~~

7. (Previously Presented) A method according to claim 6, comprising selecting another storage device for storage, if the expiry date of the application data is outside of the predetermined range of the latest expiry date.

8. (Previously Presented) A method according to claim 1, comprising storing for each of the storage devices a target expiry date, and selecting which of the storage devices to use in dependence on a comparison of the expiry date and the target expiry date.

9. (Previously Presented) A method according to claim 8, comprising preventing application data from being stored on a storage device, if the target expiry date for that storage device is earlier than the expiry date.

10. (Previously Presented) A method according to claim 8, comprising preventing application data from being stored on a storage device if the target expiry date for that storage device is earlier than the expiry date by more than a predetermined margin.

11. (Previously Presented) A method according to claim 1, comprising, after the data file has been written to the storage device, preventing the file from being modified or deleted until the expiry date has passed.

12. (Previously Presented) A method according to claim 6, comprising, after the latest expiry date has passed, erasing the contents of the storage device.

13. (Previously Presented) A method according to claim 1, wherein the characteristics of the data to be stored include a classification of the content of the application data.

14. (Previously Presented) A method according to claim 13, comprising: storing for each of the storage devices, a target content type; comparing the classification of the content of the application data and the target content type; and preventing the application data from being stored in a storage device if the target content type for that device and the classification do not match.

15. (Previously Presented) A method according to claim 1, wherein the characteristics of the data to be stored include the application program which requires its storage.

16. (Previously Presented) A method according to claim 1, wherein the characteristics of the data to be stored include the size of the application data.

17. (Previously Presented) A method according to claim 1, comprising writing the application data to and/or reading the application data from the storage devices directly using the application programs via the computer network.

18. (Previously Presented) A method according to claim 1, comprising notifying the application program of the storage device used to store the data file as determined by the broker program, such that the application program can store means to identify the device.

19. (Previously Presented) A method according to claim 18, wherein the data files are retrieved from the storage device by the application program directly via the computer network and without reference to the broker program.

20. (Previously Presented) A method according to claim 1, comprising determining, using the broker program, the directory location for storage of the data file on the storage devices.

21. (Previously Presented) A method according to claim 20, comprising creating, using the broker program, the directory entry for the data file in the directory location in anticipation of data being written to the file by the application program requesting storage.

22. (Previously Presented) A method according to claim 20, comprising notifying, using the broker program, the directory location of the data file to the application program for storage by the application program.

23. (Previously Presented) A method according to claim 20, wherein the directory entry for the data file in the directory location is created by the application program prior to data being written by it.

24. (Previously Presented) A method according to claim 1, wherein the state of the storage devices includes the current availability of such devices for data to be written thereto.

25. (Previously Presented) A method according to claim 1, wherein the state of the storage devices includes the amount of free space available in the storage devices.

26. (Previously Presented) A method according to claim 1, wherein the state of the storage devices includes the rate at which data is being read from and/or written to such devices.

27. (Previously Presented) A method according to claim 1, comprising monitoring the status of the storage devices, detecting when new storage devices have been added, and making these available for storage.

28. (Currently Amended) A method of operating a data processing system to store data, comprising:

receiving a request from an application program, among one or more application programs, for storage of a data file of application data of the application program, the request including an expiry date set by the application program, beyond which the data file is no longer required and may be deleted;

determining one or more characteristics of the application data file, including the expiry date;

monitoring the status of storage devices in a plurality of physical storage devices; and

selecting a physical storage device from the plurality of physical storage devices to store the data file according to the expiry date of the data file and a state of the physical storage device, wherein the data file is stored on the selected physical storage device, by:
device; and

determining that the expiry date of the data file occurs before a device expiry date associated with the physical storage device; and

determining that the expiry date of the data file occurs within a predetermined range of the device expiry date; and

preventing the data file from being deleted until the expiry date of the data file has been reached.

29. (Currently Amended) A system for storing data comprising:
a plurality of physical storage devices;
a processor in communication with the plurality of physical storage devices, wherein
the processor is configured to: ~~processor:~~

~~receives~~ receive a request for storage of a data file of application data from
one or more application programs requiring persistent data storage, the request including an
expiry date set by the application program, beyond which the data file is no longer required
and may be deleted; and

~~selects~~ select a first physical storage device ~~one~~ of the plurality of physical
storage devices to store the data file according to the expiry date of the data file and a state of
the physical storage device, such that the data file is stored in the selected physical storage
device, by: device; and

determining that the expiry date of the data file occurs before a device expiry
date associated with the first physical storage device; and

determining that the expiry date of the data file occurs within a predetermined
range of the device expiry date; and

prevents the data file from being deleted until the expiry date of the data file has been
reached.

30. (Currently Amended) A system according to claim 29, comprising a look-up
table accessible by the ~~processor broker program~~, wherein the ~~look-up~~ look-up table stores
the remaining storage space available on ~~[[I]]~~ each of the storage devices such that in-use ~~in-~~
~~use~~ storage devices which have had data files written to them and empty storage devices
which have not are distinguished from each other.

31. (Currently Amended) A system according to claim 30, wherein the ~~broker
program is operable~~ the processor is configured to select in-use storage devices in preference
to empty storage devices.

32. (Currently Amended) A system according to claim 30, wherein the look-up table stores how much data is waiting to be written to each storage device, such that an overload condition in the process of writing the data to a storage device can be detected; wherein the ~~broker program is operable~~ processor is configured to select, if an overload condition is detected for a storage device selected for storage, a different storage device for storage.

33. (Currently Amended) A system according to claim 32, wherein the ~~broker program is operable~~ processor is configured to select in-use storage devices in preference to empty storage devices.

34. (Currently Amended) A system according to claim 29, comprising a look-up table accessible by the ~~broker program,~~ processor, wherein the look-up table stores, for each storage device, the latest expiry date of data files stored on that device, or of data files that are to be stored, and wherein the ~~broker program is operable~~ processor is configured to permit application data to be stored on a storage device if its expiry date is within a predetermined range occurring after of the latest expiry date. ~~date, such that application data with similar expiry dates can be stored together and when such similar expiry dates have passed the storage device can be erased and re-used.~~

35. (Currently Amended) A system according to claim 34, wherein the ~~broker program is operable~~ processor is configured to select another storage device for storage, if the expiry date of the application data is outside of the pre-determined range of the latest expiry date.

36. (Currently Amended) A system according to claim 29, comprising a look-up table accessible by the ~~broker program,~~ processor, wherein the look-up table stores, for each storage device a target expiry date, and the ~~broker program is operable~~ processor is configured to select which of the storage devices to use in dependence on a comparison of the expiry date and the target expiry date.

37. (Currently Amended) A system according to claim 36, wherein the ~~broker program is operable~~ processor is configured to prevent application data from being stored on a storage device, if the target expiry date for that storage device is earlier than the expiry date.

38. (Currently Amended) A system according to claim 36, wherein the ~~broker program is operable~~ processor is configured to prevent application data from being stored on a storage device if the target expiry date for that storage device is earlier than the expiry date by more than a predetermined margin.

39. (Currently Amended) A system according to claim 29, wherein the ~~broker program is operable~~ processor is configured to prevent, after the data file has been written to the storage device, the file from being modified or deleted until the expiry date has passed.

40. (Currently Amended) A system according to claim 34, wherein the ~~broker program is operable~~ processor is configured to erase, after the latest expiry date has passed, the contents of the storage device.

41. (Previously Presented) A system according to claim 29, wherein the characteristics of the data to be stored include a classification of the content of the application data.

42. (Currently Amended) A system according to claim 41, comprising a look-up table accessible by the processor, ~~broker program~~, wherein the ~~[[I]]~~ look-up table stores a target content type; and wherein the ~~broker program is operable~~ processor is configured to compare the classification of the content of the application data and the target content type, and prevent the application data from being stored in a storage device if the target content type for that device and the classification do not match.

43. (Previously Presented) A system according to claim 29, wherein the characteristics of the data to be stored include the application program which requires its storage.

44. (Previously Presented) A system according to claim 29, wherein the characteristics of the data to be stored include the size of the application data.

45. (Currently Amended) A system according to claim 29, wherein the ~~broker program is operable to~~ processor is configured to notify the application program of the storage device used to store the data file as ~~[[I]] determined by the processor, broker program,~~ such that the application program can store means to identify the device.

46. (Currently Amended) A system according to claim 29, wherein the ~~broker program is operable~~ processor is configured to determine the directory location for storage of the data file on the storage devices.

47. (Currently Amended) A system according to claim 46, wherein the ~~broker program is operable~~ processor is configured to notify the directory location of ~~[[I]]~~ the data file to the application program for storage by the application program.

48. (Previously Presented) A system according to claim 29, wherein the state of the storage devices includes the current availability of such devices for data to be written thereto.

49. (Previously Presented) A system according to claim 29, wherein the state of the storage devices includes the amount of free space available in the storage devices.

50. (Previously Presented) A system according to claim 29, wherein the state of the storage devices includes the rate at which data is being read from and/or written to such devices.

51. (Currently Amended) A system according to claim 29, wherein the ~~broker program is operable~~ processor is configured to monitor the status of the storage devices, detect when new storage devices have been added, and make these available for storage.

52. (Currently Amended) A system for storing data, comprising:
one or more application programs requiring persistent data storage for data files of application data;
a plurality of physical storage devices each accessible via a computer network to one or more computers executing the application programs; and
a broker program configurable to:
receive a request from an application program for storage of a data file of application data of an application program, the request including an expiry date set by the application program, beyond which the data file is no longer required and may be deleted;
select a first physical storage device ~~one~~ of the plurality of physical storage devices to store the data file according to the expiry date of the data file and a state of the ~~plurality of~~ first physical storage device by: device; and
determining that the expiry date of the data file occurs before a device expiry date associated with the first physical storage device; and
determining that the expiry date of the data file occurs within a predetermined range of the device expiry date; and
prevent the data file from being deleted until the expiry date of the data file has been reached.

53. (Previously Presented) A system according to claim 52, comprising an Application Program Interface running on the one or more computers to pass commands to and from the broker program and the application program.

54. (Currently Amended) A computer program product for controlling a computer in a data storage system, the computer being operable to receive requests from one or more application programs, running on one or more computers, and requiring persistent data storage for data files of application data, and operable to monitor a plurality of physical storage devices, the computer program product comprising:

a recording medium readable by the computer, having program code stored thereon which when executed on the computer configures the computer to perform the steps of:

receiving a request for storage of a data file of application data from an application program, the request including an expiry date set by the application program, beyond which the data file is no longer required and may be deleted;

selecting a first physical storage device ~~one~~ of the plurality of physical storage devices to store the data file according to the expiry date of the data file and the state of the first physical storage device by: device; and

determining that the expiry date of the data file occurs before a device expiry date associated with the first physical storage device; and

determining that the expiry date of the data file occurs within a predetermined range of the device expiry date; and

preventing the data file from being deleted until the expiry date of the data file has been reached.

55. (Previously Presented) A computer program product according to claim 54, which when executed on the computer configures the computer to monitor the remaining storage space available on each of the storage devices to distinguish between in use storage devices which have had data files written to them, and empty storage devices which have not.

56. (Previously Presented) A computer program product according to claim 55, wherein the selecting step comprises selecting in-use storage devices in preference to empty storage devices.

57. (Previously Presented) A computer program product according to claim 55, which when executed on the computer configures the computer to monitor how much data is waiting to be written to each storage device, to detect an overload condition in the process of writing the data; and select, if an overload condition is detected for a storage device selected for storage, a different storage device for storage.

58. (Previously Presented) A computer program product according to claim 57, wherein the selecting step comprises selecting in-use devices in preference to empty devices.

59. (Currently Amended) A computer program product according to claim 54, which when executed on the computer configures the computer to: store, for each storage device, the latest expiry date of data files stored on that device, or of data files that are to be stored; and permit application data to be stored on a storage device if its an expiry date associated with the application data is within a predetermined range occurring after of the latest expiry date. ~~date; such that application data with similar expiry dates can be stored together and when such similar expiry dates have passed the storage device can be erased and re-used.~~

60. (Previously Presented) A computer program product according to claim 59, which when executed on the computer configures the computer to: select another storage device for storage, if the expiry date of the application data is outside of the pre-determined range of the latest expiry date.

61. (Previously Presented) A computer program product according to claim 58, comprising storing for each of the storage devices a target expiry date, and selecting which of the storage devices to use in dependence on a comparison of the expiry date and the target expiry date.

62. (Previously Presented) A computer program product according to claim 61, which when executed on the computer configures the computer to prevent application data from being stored on a storage device, if the target expiry date for that storage device is earlier than the expiry date.

63. (Previously Presented) A computer program product according to claim 61, which when executed on the computer configures the computer to prevent application data from being stored on a storage device if the target expiry date for that storage device is earlier than the expiry date by more than a predetermined margin.

64. (Previously Presented) A computer program product according to claim 57, which when executed on the computer configures the computer to prevent, after the data file has been written to the storage device, the file from being modified or deleted until the expiry date has passed.

65. (Previously Presented) A computer program product according to claim 59, which when executed on the computer configures the computer to erase the contents of the storage device, after the latest expiry date has passed.

66. (Previously Presented) A computer program product according to claim 54, wherein the characteristics of the data to be stored include a classification of the content of the application data.

67. (Previously Presented) A computer program product according to claim 66, which when executed on the computer configures the computer to: store for each of the storage devices, a target content type; compare the classification of the content of the application data and the target content type; and prevent the application data from being stored in a storage device if the target content type for that device and the classification do not match.

68. (Previously Presented) A computer program product according to claim 54, wherein the characteristics of the data to be stored include the application program which requires its storage.

69. (Previously Presented) A computer program product according to claim 54, wherein the characteristics of the data to be stored include the size of the application data.

70. (Previously Presented) A computer program product according to claim 54, which when executed on the computer configures the computer to notify the application program of the storage device used to store the data file as determined by the broker program, such that the application program can store means to identify the device.

71. (Previously Presented) A computer program product according to claim 54, which when executed on the computer configures the computer to determine the directory location for storage of the data file on the storage devices.

72. (Previously Presented) A computer program product according to claim 71, which when executed on the computer configures the computer to notify the directory location of the data file to the application program for storage by the application program.

73. (Previously Presented) A computer program product according to claim 54, wherein the state of the storage devices includes the current availability of such devices for data to be written thereto.

74. (Previously Presented) A computer program product according to claim 54, wherein the state of the storage devices includes the amount of free space available in the storage devices.

75. (Previously Presented) A computer program product according to claim 54, wherein the state of the storage devices includes the rate at which data is being read from and/or written to such devices.

76. (Previously Presented) A computer program product according to claim 54, which when executed on the computer configures the computer to monitor the status of the storage devices, detecting when new storage devices have been added, and making these available for storage.

77. (Currently Amended) A computer program product for controlling a computer in a data storage system, the computer program product comprising a recording medium readable by the computer, having program code stored thereon which when executed on the computer configures the computer to perform the steps of:

receiving a request from an application program, among one or more application programs, for storage of a data file of application data of the application program, the request including an expiry date set by the application program, beyond which the data file is no longer required and may be deleted;

determining one or more characteristics of the application data, including the expiry date;

monitoring the status of storage devices in a plurality of physical storage devices;

selecting a first physical storage device from the plurality of physical storage devices to store a data file of application data according to the expiry date of the data file and a state of the storage device, wherein the data file is stored on the selected physical storage device, ~~by: device;~~ and

determining that the expiry date of the data file occurs before a device expiry date associated with the first physical storage device; and

determining that the expiry date of the data file occurs within a predetermined range of the device expiry date; and

preventing the data file from being deleted until the expiry date of the data file has been reached.

78. (Canceled)

79. (Canceled)

80. (Canceled)

81. (Previously Presented) A method according to claim 1, wherein the selecting of which one of the plurality of physical storage devices will be used to store the data file comprises selecting a storage device based on an amount of free space available in the storage devices so that the selected physical storage device is filled and eligible for re-use as soon as possible.

82. (Previously Presented) A method according to claim 28, wherein the selecting a physical storage device comprises selecting a physical storage device based on an amount of free space available in the storage devices so that the selected physical storage device is filled and eligible for re-use as soon as possible.

83. (Previously Presented) A system according to claim 29, wherein the processor further selects which one of the plurality of physical storage devices based on an amount of free space available in the storage devices so that the selected physical storage device is filled and eligible for re-use as soon as possible.

84. (Previously Presented) A system according to claim 52, wherein the broker program further selects the selected physical storage device based on an amount of free space available in the storage devices so that the selected physical storage device is filled and eligible for re-use as soon as possible.

85. (Previously Presented) A computer program product according to claim 54, the select step is further in accordance with an amount of free space available in the storage devices so that the selected physical storage device is filled and eligible for re-use as soon as possible.

86. (Previously Presented) A computer program product according to claim 77, wherein the selecting a physical storage device comprises selecting a physical storage device based on an amount of free space available in the storage devices so that the selected physical storage device is filled and eligible for re-use as soon as possible.